

Landscape and Wildlife Ecology

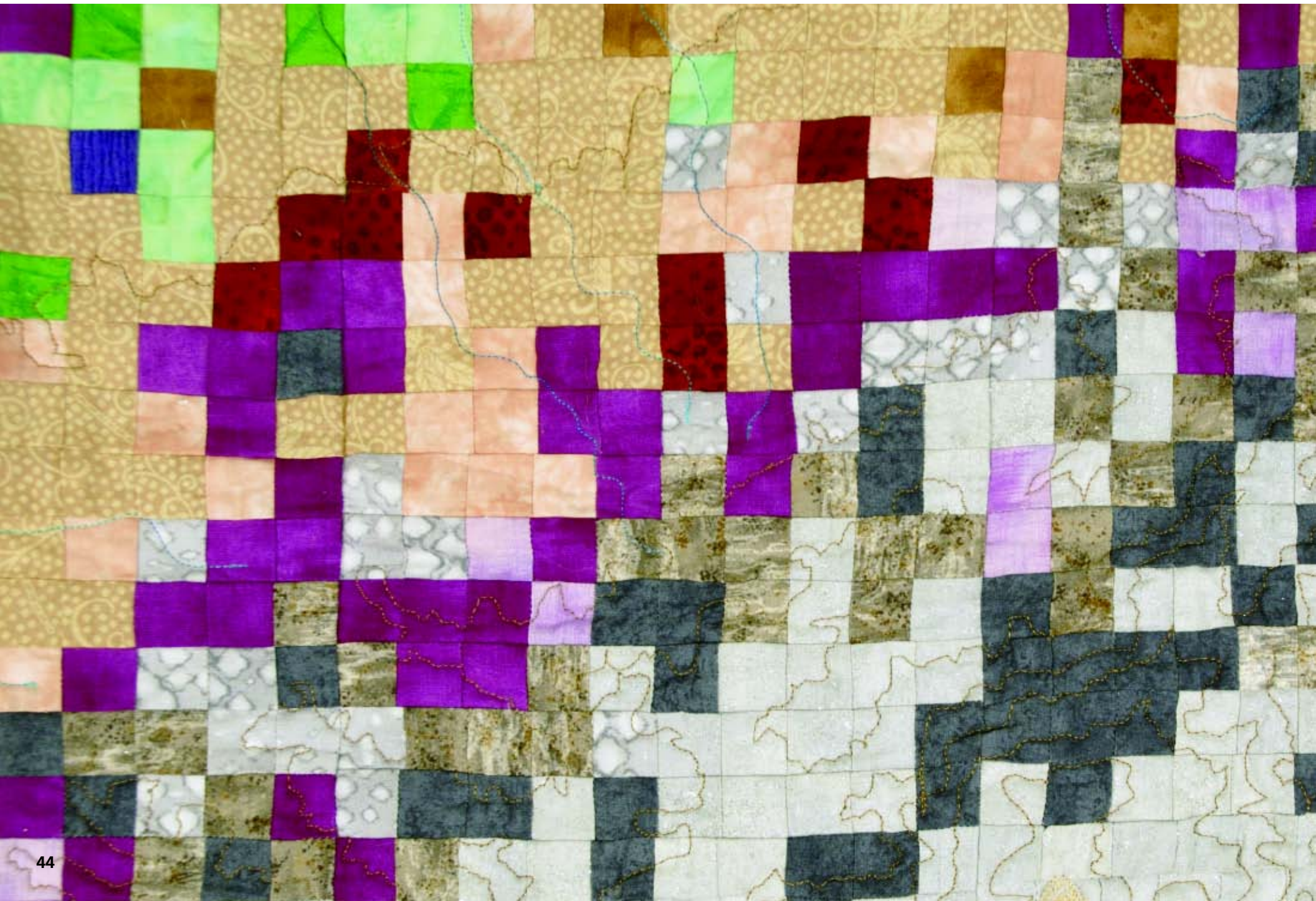




Photo by Tom Walker

Interpreting Denali's Landcover Types with Fabric (Quilt)

by Lucy Tyrrell and Jon Paynter

Abstract

Denali Quilters created a quilt (129 x 130.5 inches, or approximately 3.3 meters square) to interpret Denali National Park and Preserve's landcover types at large and small scales. The central map is a satellite image of 23 landcover types (13,600 colored fabric pixels). Twenty-two blocks surround the map, each depicting a close-up view of selected plants and animals (e.g., nose and curl of horn of Dall sheep among mountain avens and rock) found in a cover type (e.g., Dwarf Shrub-Rock). The machine quilting outlines the park's boundary, highlights drainages and topographic lines, and depicts animal tracks. The quilt combines art and science.

In this close up view of part of the quilt, the fabric pixels and the stitches (quilting) that hold the layers of the quilt together are visible. One pixel measures 3/4 inch (2 cm). Curving lines quilted in brown thread show the rugged topography in the "Snow and Ice" (sparkling white pixels) and "Bare Ground" (mottled tan pixels) of the Alaska Range. Rivers, quilted in blue thread, flow from the mountains to the northwest lowlands of "Woodland Spruce" and "Stunted Spruce" (green pixels).

Introduction

Over approximately four years, 2002-2006, Denali Quilters designed and created a quilt to interpret Denali National Park and Preserve's landcover types at large and small scales. The two scales depicted in the quilt are ones not commonly experienced by the average visitor riding a bus into the park: the view from a satellite and the close-up view, as if looking through a macro lens. The finished quilt measures 129 x 130-1/2 inches (~3.3 x 3.3 m) (*Figure 1*).

Methods

The basis for the central portion of the quilt is a composite map of several satellite images covering the park's six million acres, in which 23 landcover types have been classified (*Stevens et al. 2001*) (*Figure 2*). The map includes a 10-mile buffer around the park boundary.

To select pixel size, using the park GIS (Geographic Information System), we enlarged the pixel size of the raster landcover map to a size large enough to be practical to sew using fabric, yet not lose the definition of some landscape features (e.g., the Alaska Range). The total number of pixels was also an important consideration. We experimented with 3/4-, 1-, 1-1/2-, and 2-inch (2-, 2.5-, 4-, and 5-cm) pixels which would have meant a total of 13,600, 11,235, 4,970, or 2,756 squares of fabric, i.e., the fabric pixels, respectively (*Figure 3*). The size of the quilt map was set to be about eight feet (2.4 meters) on a side.

"Cloud" pixels (where the landcover was obscured by clouds) were included in the original landcover mapping project, but were eliminated for the quilt map. We changed each of the 18 cloud pixels to the predominant landcover type in the immediate vicinity.



Figure 1. Denali Landcover Quilt.

Cotton fabrics were carefully selected to match the colors that researchers had used when previously classifying the composite satellite image into landcover types. However, we substituted black for brown for the “burn” landcover type so someone with red-green color blindness could easily discriminate burn pixels from those of the other landcover types. Print fabrics were chosen to add interest; however, only fabrics with a small print design were used, so all pixels cut from one fabric would look similar.

As an aid to converting the paper map to the fabric map, we printed a paper map with a grid overlay marking every ten pixels both horizontally and vertically. Columns were labeled A-M, and Rows 1-13. We marked each 100-pixel subunit with its identifying column and row (e.g., A6, D10) and then cut along the grid lines. Denali Quilters tallied for each of the 136 map subunits how many fabric pixels of each color were needed. Denali Quilters packaged fabric pixels for each subunit into Ziploc bags, along with the paper subunit map “pattern” to show pixel arrangement. During these steps, the quilt became informally known as the “Pixel Project”.

To facilitate sewing of subunits, quilters arranged the fabric pixels (100) to match the subunit map, and then sewed them together by rows. They steamed completed subunits to a uniform size before stitching them together into larger “superunits”. Finally the superunits were assembled as the entire map.

To form the border of 22 blocks around the map, each quilter was randomly assigned a landcover type and created her own block design. The quilt committee provided guidance about block dimensions and condensed information about each landcover type (Stevens et al. 2001), along with a list of common plants and animals. The goal was to have blocks show selected aspects of a landcover type—from a close-up, *not* a landscape viewpoint.

Cheryl Schikora, of Chatty Ladies Quilting Studio in Fairbanks, used a 14-foot (4.3-meter) long-arm quilting machine to quilt together the layers (quilt top, batting, and backing) following guidance and illustrations provided by

Denali Quilters. In July 2006, as a completion rite for this challenging project, Denali Quilters gathered around the quilt and many hands stitched the black binding.

Results

We selected a pixel size of 3/4 inch (2 cm) for a total of 13,600 pixels in the map. The map scale is one inch (2.5 cm) on the quilt equals 1.5 miles (~1.8 km) on the ground. The fabrics match colors that park staff selected when previously classifying the composite image into landcover types.

Not only is the fabric map accurate in terms of construction from a satellite image and fabric colors that match those used by the landcover mapping project, the machine quilting also adds accurate map features. The quilting stitches show the park boundary and Park Road (black thread), major river drainages and lakes (blue), and topographic lines at a contour interval of 2,500 feet (~1,000 m) (brown). The two tallest peaks (Foraker and McKinley) are each indicated with a summit symbol. Because two of the major large mammals (wolf and caribou) had not been included

in the border blocks, tracks of these two species were subtly quilted using a trapunto technique (stitches make the tracks slightly three-dimensional) in the white background surrounding the map (Figure 6). As with any map, the quilt map includes a landcover legend (key), map scale, and compass rose.

Twenty-two blocks surround the map, each depicting a close-up view of selected plants and animals (e.g., nose and curl of horn of Dall sheep (*Ovis dalli dalli*) among mountain aven (*Dryas* spp) and rock) found in a landcover type (e.g., Dwarf Shrub-Rock) (Figure 4). As much as possible, the border blocks were arranged around the map to reflect the elevation and geography of the landcover types. Lowland boreal types are located at the bottom of the map, while sub-alpine shrub and tundra cover types were arranged in the side borders,

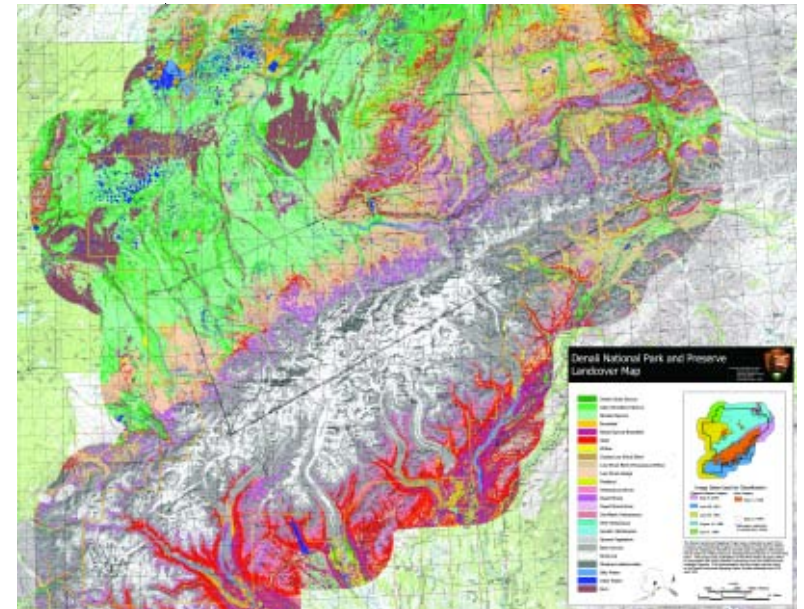


Figure 2. This landcover type map of Denali National Park and Preserve (Stevens et al. 2001) was the basis of the landcover quilt.

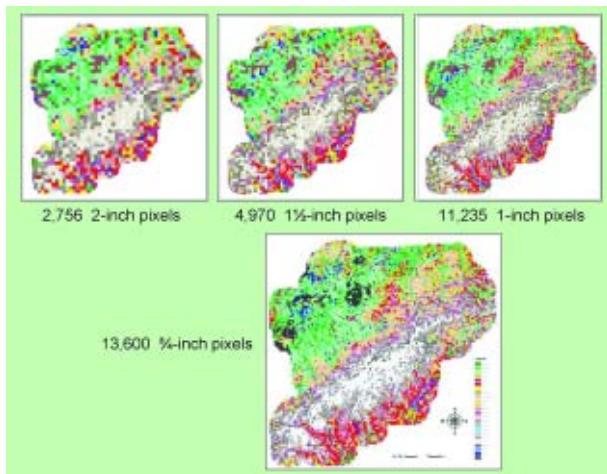


Figure 3. Geographic Information Systems (GIS) software was used to change the pixel size and pixel number of the landcover map, in order to create several options for the map part of the quilt.



Figure 4. This border block (left) illustrates "Dwarf Shrub - Rock". Quilters were instructed to create a close up view of each landcover type (here mountain avens and the nose of a Dall sheep are visible) rather than a landscape view (e.g., the scene of two Dall sheep on the rocky alpine slopes typical of the Dwarf Shrub - Rock cover type as in the foreground of the photo at right).



Figure 5. "Burn" landcover type. Two blackened spruce trees stand after a wildfire has swept to the horizon and only a few lingering flames persist (upper panel). After a few years, the charred trees have lost limbs but are surrounded by colors of fireweed and bluebells (lower panel).

and high elevation alpine types in the upper row. The blocks on the left side of the map tend to be landcover types that occur only south of the Alaska Range and those on the right side of the map tend to be types that are primarily north of the Alaska Range.

Denali Quilters depicted physical features (ice, rock, braided streams) as well as biological features (trees, shrubs, flowering plants, lichens, fungi, mammals, and birds) present in landcover types. Recognizable by species in the blocks are ten mammals, eight birds, four trees, and 24 other plants. Not surprisingly, several common plants and animals were portrayed in more than one block. Thus the quilt reflects the ecological reality that many species including blueberry, dwarf and shrub birch, mountain avens, cotton grass sedge, white-crowned sparrow, red-backed vole, moose, and bear occur in more than one landcover type.

Denali Quilters invested approximately 1,000 person-hours to plan and create the quilt top, prepare the backing, and whipstitch the binding. Approximately 100 additional hours were spent quilting the layers together and creating the sleeve for hanging the quilt.

Discussion and Conclusions

The Denali Landcover Quilt is a lesson in contrasts—it shows large and small scales; it showcases high-tech GIS and low-tech hand sewing; it melds the tradition of making quilts to share stories and a new-fangled 14-foot (4.3-meter) long-arm quilting machine; and it renders an artistic expression of science, yet demands scientific accuracy in its portrayal of Denali landcover types.

Denali Quilters has decided to loan the quilt where it can be displayed on a long-term basis to foster learning about quilting, maps and scale, GIS technology, satellite imagery, landcover types, vegetation, wildlife habitat, and

natural history. In its combination of science and art, the spirit of the Denali Landcover Quilt extends an invitation to viewers to take a closer look at Denali and explore both what can be learned from the fabric creation and from stepping into its wild landscapes.

Acknowledgements

Denali Quilters (approximately 40 members) designed, cut, and sewed the quilt top (map and borders), and completed the binding. Cheryl Schikora (Chatty Ladies Quilting Studio of Fairbanks) quilted the layers together.

Lucy Tyrrell conceived the idea for the project while viewing a small wall quilt displayed as part of a poster at the 2004 Ecological Society of America Meeting (Zobel and Zobel 2002). The Zobel quilt depicted an oblique aerial map of the ecosystems of Cascade Head Preserve in Oregon.

We relied heavily on Denali's landcover mapping project (Stevens *et al.* 2001), not only for the GIS map classified by landcover types, but also for photographs and information about

each landcover type. Assistance with lists of common plants and animals for each landcover type was provided by Denali National Park Service staff, including Carol McIntyre, Tom Meier, Pat Owen, and Carl Roland.

References

- Stevens, Jennifer L., Keith Boggs, Ann Garibaldi, Jess Grunblatt, and Todd Helt. 2001. *Denali National Park and Preserve Landcover Mapping Project*. Earth Satellite Corporation. Rockville, MD. Volumes 1 and 2.
- Zobel, Donald, and Priscilla Zobel. 2002. *Cascade Head, Oregon—Interpreting ecological properties and research to the public*. Poster abstract in Abstracts: 87th Annual Meeting of Ecological Society of America, Tucson, Arizona.



Figure 6. Closeup of trapunto technique (raised effect created by surrounding stitches) used to quilt caribou tracks (shown here) and wolf tracks into the white background of the map part of the quilt.

Photo by Tom Walker